

UNPUBLISHED PRELIMINARY DATA

Quarterly Status Report for the Period
January 1, 1965 through March 31, 1965
on
NASA Contract R-09-022-029

Accomplishments made on this Project for the period January 1, 1965 through March 31, 1965 may be outlined as follows:

(1) The literature, as recorded in Chemical Abstracts, on the electrolytic conductivity, transference numbers, and ionic mobilities of electrolytes in aqueous, nonaqueous, and molten salt systems was reviewed for the period 1951 to 1959, inclusive. Data were collected but not critically evaluated. This extends the total coverage, to date, from 1937 to 1959, inclusive.

(2) The literature, as recorded in Chemical Abstracts, on the activities and activity coefficients of electrolytes in aqueous, nonaqueous, and molten salt systems was reviewed from 1955 to 1958, inclusive. Data were collected but not critically evaluated. This extends the total coverage, to date, from 1955 to 1963, inclusive.

(3) The literature, as recorded in Chemical Abstracts, on the electromotive forces and electrode potentials of galvanic cells made with aqueous, nonaqueous, and molten salt systems was reviewed for the period 1955 to 1958, inclusive. Data were collected but not critically evaluated except for some data on the potential of the silver-silver chloride electrode in ethanol and ethanol-water mixtures.

(4) Theoretical values of mean activity coefficients of 1-1, 1-2 (or 2-1), 1-3 (or 3-1), 1-4 (or 4-1), 2-2, 2-3 (or 3-2), 2-4 (or 4-2), 3-3, 3-4 (or 4-3), and 4-4 electrolytes were evaluated for ionic strengths of 0.0001 to 0.1 inclusive and at temperatures of 0, 5, 10, 15, 18, 20, 25, 30, 35, 38, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, and 100 by:

(a) Limiting law of Debye and Hückel.

(b) Guntelberg method wherein the closest distance of approach of ions is taken as approximately 3 angstroms, or by the equation:

$$\log \gamma_{\pm} = -Z_1 Z_2 \sqrt{I} / (1 + \sqrt{I})$$

where γ_{\pm} is the mean activity coefficient, Z_1 is the cationic valence, Z_2 the anionic value, A the Debye-Hückel constant and I the ionic strength.

(c) Davies method wherein the above equation is modified to

$$\log \gamma_{\pm} = -Z_1 Z_2 A [\sqrt{I} / (1 + \sqrt{I}) - 0.2I]$$

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- (d) Scatchard method wherein

$$\log \gamma_{\pm} = -Z_1 Z_2 A / I \quad (1 = 1.5/I)$$

- (e) Method wherein closest distance of approach of the ions is taken as 3 angstrom units at all temperatures, namely

$$\log \gamma_{\pm} = -Z_1 Z_2 A / I \quad (1 + 3B/I)$$

where B is the Debye-Hückel constant relating to ion size.

- (f) Method wherein closest distance of approach of the ions is taken as 4.5 angstrom units at all temperatures, namely

$$\log \gamma_{\pm} = -Z_1 Z_2 A / I \quad (1 + 4.5B/I)$$

- (g) Method wherein the Bjerrum critical ion size is used, namely

$$\log \gamma_{\pm} = -Z_1 Z_2 A / I \quad (1 + a_B B / I)$$

where a_B is the Bjerrum critical ion size in angstroms.

Methods (a), (b), and (d) were completed; the others partially completed.



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